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Nonlinear Effects of Inflation on Growth: Comment

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Nonlinear Effects of Inflation on Growth: Comment

One of the most important developments in macroeconomic policy-making over the last two decades has been the growing recognition that inflation is usually bad for economic growth. There is still substantial disagreement among researchers, however, about how quantitatively important are the growth depressing effects of inflation and at what levels of inflation these effects begin to appear. Some economists have been concerned by rates of inflation of three or four percent while others have been unconcerned by rates of twenty or thirty percent.

A recent paper by Sarel (1996) makes an important contribution to the research literature on the growth effects of inflation. Much of the literature has assumed that the effects of inflation on growth are linear. But threshold rates of inflation may have to be surpassed before the growth depressing effects of inflation become important. Sarel shows that failure to take such thresholds into account leads to a substantial downward bias in estimates of the growth costs of inflation. Most analysis of nonlinear or threshold effects (such as Fischer, 1993; Barro, 1996; and Sarel, 1996) groups together industrial and developing countries. Recent research has demonstrated that the size of the growth-depressing effects of inflation differ substantially between the industrial and developing countries, however.¹ Thus it seems quite likely that the position of thresholds may differ as well.

Once the threshold has been passed, there is a second potentially important aspect of the nonlinear effects of inflation on growth not discussed by Sarel. The marginal growth costs may not be constant as the rate of inflation increases. While the total costs

of inflation will undoubtedly continue to climb as the inflation rate increases, it seems quite plausible that at least after some point the marginal effects will begin to decline. Thus, for example, going from an inflation rate of 30 to 40 percent seems likely to generate more additional uncertainty than going from 130 to 140 percent. Indeed Fischer (1993), using break points of 15 and 40 percent, shows the coefficients on inflation rates above 40 to be substantially lower than for those between 15 and 40. Barro (1996), on the other hand, is not able to reject linearity for his sample. Using the same breakpoints as Fischer, Barro finds that the differences in coefficients are not significant. The pattern (-0.16, -0.37, and -0.23) is, however, suggestive of nonlinearity of the same type found by Fischer. While we believe Fischer's results to be quite plausible, his thresholds were picked by judgment rather than statistical methods. Sarel makes an important innovation by following a search procedure for the initial threshold that he identifies as eight percent for his combined sample of industrial and developing countries. He does not discuss the issue of the behavior of the marginal costs of inflation once the threshold is passed, however.

We follow Sarel's search procedure but consider separately the data for industrial and developing countries and find that they do indeed tell different stories.² As reported in Tables 1 and 2, we detect the threshold of nine percent for industrial countries and ten percent for developing countries. These thresholds differ little from Sarel's eight percent threshold for his combined sample. For the industrial countries, the effects of rising rates of inflation below the threshold are negative, but statistically insignificant, just as Sarel found for his combined sample. However, for the developing countries, the effects below

the threshold are positive and significant, albeit fairly small compared with the negative effects above the threshold.

Sarel enters inflation in log form. A log linear relationship of course implies a diminishing marginal cost of inflation. But when Sarel breaks his sample into sub groups, the coefficients on the log of inflation rise as inflation increases, making it difficult to infer anything about changes in marginal cost. We searched for multiple breaks but found only one when using the log of inflation. However, in a separate paper (Burdekin *et al.* 2000) we analyze the levels rather than logs of inflation. This results in evidence for multiple breaks for the developing countries sample at around 50 and 100 percent, each break being associated with a substantial decline in marginal costs.³ We also find that, while estimates of the effects of raising inflation from low initial rates remain positive, large, and significant, the threshold at which the marginal effects of higher inflation becomes negative falls from ten to three percent.

The substantial difference between Sarel and ourselves in our findings for developing countries may result not only from the choice of functional form but also the consideration of negative values of inflation. Since one cannot take the log of a negative number, Sarel replaced all of the negative inflation rates in his sample with 0.1, a procedure we also followed for the results in Tables 1 and 2. When we use the actual inflation rates, we can of course include the true negative values. To check whether the influence of levels versus logs of inflation was the primary cause of the difference in the estimated initial threshold level for the developing countries, we again deleted all negative inflation rates. This had virtually no effect on the threshold or coefficient values (the greatest difference being 0.001), except for the first threshold. When the negative

rates of inflation are omitted, the first threshold drops to one percent while the coefficient on the zero to one range remains positive and significant but becomes implausibly large (rising from 0.36 to 6.2).

We suspect that these results are telling us that negative rates of inflation are inimical to growth, and that the largest proportional gains from policy come from avoiding outright deflation. While the possibility of a narrow range of positive inflation rates helpful to growth cannot be ruled out, we believe that more research is called for before recommending even limited inflation as an actual policy goal, however. As former Bundesbank President Otmar Emminger once put it: “In the long run, an economy cannot have ‘just a little inflation,’ for if you start flirting with inflation, it will end up marrying you.”⁴

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Table 1. Nonlinear Estimation for Industrial Countries Using Fixed Effects

<i>Variable</i>	<i>Coefficient</i>
First difference of inflation	0.13 (4.13)
Log of previous period real GDP per capita	-0.03 (6.25)
Population growth	-0.89 (4.28)
Ratio of real government expenditure to real GDP	-0.003 (4.01)
Inflation: below 9%	-0.02 (1.38)
Inflation: above 9%	-0.05 (8.17)
Inflation: without structural breaks	-0.008 (9.01)

Notes: *R-squared* = 0.37; number of observations = 583; t-statistics are in parentheses.

Table 2. Nonlinear Estimation for Developing Countries Using Fixed Effects

<i>Variable</i>	<i>coefficient</i>
First difference of inflation	-0.00006 (0.28)
Log of previous period real GDP per capita	0.018 (2.41)
Population growth	-0.153 (1.48)
Ratio of real government expenditure to real GDP	-0.0019 (3.99)
Log (1 + black-market exchange rate premium)	-0.021 (2.73)
Percentage change in terms of trade	0.031 (3.78)
Inflation: below 10%	0.0040 (2.53)
Inflation: above 10%	-0.019 (8.23)
Inflation: without structural breaks	-0.0037 (2.89)

Notes: *R-squared* = 0.32; number of observations = 1180.

¹ See, for example, Burdekin *et al.* (1994, 1995) and Kim and Willett (2000).

² Sarel investigates 87 combined industrial and developing countries. Because of problems of data availability, our sample was a little smaller. We investigated 21 industrial and 51 developing countries separately. Sarel employs five year-average data from 1970-1990 while we use annual data from 1967-1992. Sarel's data sources are Penn World Tables (5.5) and World Tables (World Bank). In addition we use World Currency Year Books, and International Financial Statistics (CD-ROM). Most of our variables are similar to Sarel (first difference of inflation, initial income, population growth, and government expenditure for industrial countries) but we omit two control variables (black market exchange rate premium and the terms of trade) since they are not significant. For developing countries, the sets are the same. Sarel's estimation method is OLS with country and period dummies. We use GLS with country dummies for industrial countries since we found no differences across periods for the industrial countries (1967-1972, 1973-1982, and 1983-1992). For the developing countries, we use GLS with both period and country dummies.

³ These results are reported in detail in Burdekin *et al.* (2000).

⁴ Quoted in Schlesinger (1984, p. 98).